



National Research University Higher School of Economics (HSE)

Basic Curriculum

Field of study 01.03.02 Applied Mathematics and Information Science
Educational Programme "Applied Data Analysis and Artificial Intelligence"

Specializations: "Applied Data Analysis", "Data Analysis in Finance", "Machine Learning Architecture"

Implementing unit: St. Petersburg School of Mathematics, Physics and Computer Science, HSE, HSE - Saint Petersburg

Years of Study: 2022/2023 - 2025/2026

Length of Programme: 4 years

Mode of Study: Full Time

Degree: Bachelor's degree

APPROVED
24.05.2022
Vice Rector
ROSHCHIN S.Y.
Signed with EDS

Block Code	Course	Subject type	Credits	Credits by Years				Planned Educational Programme Development Results
				1	2	3	4	
	Degree Programme		240,00	60,00	60,00	60,00	60,00	
	Major		167,00	45,00	41,00	38,00	43,00	
	Core Professional Block (Major)		81,00	38,00	34,00	9,00		
1	Differential Equations	C	3,00		3,00			GPC-1, GPC-2, GPC-3, PC-11, UC-1
2	Calculus 2	C	5,00		5,00			GPC-1, GPC-2, GPC-3
3	Probability Theory and Mathematical Statistics	C	14,00		8,00	6,00		GPC-1, GPC-2, GPC-3
4	Numerical and Optimization Methods	C	6,00		3,00	3,00		GPC-1, GPC-3, PC-2, PC-6, UC-1, UC-2
5	Computer Architecture	C	5,00		5,00			GPC-4, UC-1
6	Operating Systems	C	6,00		6,00			GPC-4, UC-1
7	Discrete Mathematics	C	12,00	8,00	4,00			GPC-1, GPC-2, GPC-3
8	Linear Algebra and Geometry	C	4,00	4,00				GPC-1, GPC-2, GPC-3
9	Introduction to Programming	C	4,00	4,00				GPC-1, GPC-2, GPC-3, GPC-4, GPC-5
10	Algorithms and Data Structures	C	8,00	8,00				GPC-1, GPC-2, GPC-3, GPC-4, GPC-5
11	Algebra	C	4,00	4,00				GPC-1, GPC-2, GPC-3
12	Calculus 1	C	10,00	10,00				GPC-1, GPC-2, GPC-3
	Elective Professional Block (Major)		86,00	7,00	7,00	29,00	43,00	
	Compulsory Courses		46,00	7,00	7,00	17,00	15,00	
1	Databases	C	3,00		3,00			PC-10, PC-12
2	Machine Learning: Basic Concepts	C	4,00		4,00			GPC-5, PC-10, PC-11
3	C++ Programming Language	C	4,00	4,00				GPC-5, PC-10, PC-11
4	Deep Learning (offered in a foreign language)	C	6,00			3,00	3,00	PC-10, PC-3, PC-9
5	Parallel Programming	C	4,00			4,00		PC-10, PC-11
6	Software Development	C	5,00			5,00		PC-10, PC-11
7	Research Seminar	C	11,00			5,00	6,00	PC-1, PC-2, UC-1, UC-2, UC-4
8	Project Seminar	C	9,00	3,00			6,00	UC-1, UC-2

	-		40,00		12,00	28,00	
	Applied Data Analysis		40,00		12,00	28,00	
	Обязательные дисциплины специализации		24,00		12,00	12,00	
1	Large-Scale Machine Learning	C	4,00		4,00		PC-11, PC-12, PC-14
2	Alternative Languages for the JVM	C	4,00		4,00		PC-11, PC-12, PC-14
3	Engineering Practices in Machine Learning	C	4,00		4,00		PC-11, PC-12, PC-14
4	Deep Reinforcement Learning	C	4,00			4,00	PC-10, PC-3, PC-9
5	Information Retrieval (offered in a foreign language)	C	4,00			4,00	PC-10, PC-3, PC-9
6	Self-Driving Car	C	4,00			4,00	PC-10, PC-3, PC-9
	Дисциплины специализации по выбору		16,00			16,00	
1	Game Theory and Auctions	E	4,00			4,00	PC-11, PC-12, PC-13
2	Machine Learning Engineering	E	4,00			4,00	PC-10, PC-3, PC-9
3	Unsupervised Learning	E	4,00			4,00	PC-10, PC-3, PC-9
4	Recommender Systems	E	4,00			4,00	PC-10, PC-3, PC-9
5	Generative Methods in Machine Learning	E	4,00			4,00	PC-10, PC-3, PC-9
6	Bayesian and Neurobesian Methods	E	4,00			4,00	PC-10, PC-3, PC-9
7	Stochastic Processes	E	4,00			4,00	PC-10, PC-3, PC-9
	Machine Learning Architecture		40,00		12,00	28,00	
	Обязательные дисциплины специализации		24,00		12,00	12,00	
1	Generative Methods in Machine Learning	C	4,00		4,00		PC-11, PC-12, PC-14
2	Image Analysis	C	4,00		4,00		PC-11, PC-12, PC-14
3	Natural Language Processing	C	4,00		4,00		PC-11, PC-12, PC-14
4	Bayesian and Neurobesian Methods	C	4,00			4,00	PC-10, PC-3, PC-9
5	Machine Learning Engineering	C	4,00			4,00	PC-10, PC-3, PC-9
6	Unsupervised Learning	C	4,00			4,00	PC-10, PC-3, PC-9
	Дисциплины специализации по выбору		16,00			16,00	
1	Game Theory and Auctions	E	4,00			4,00	PC-11, PC-12, PC-13
2	Self-Driving Car	E	4,00			4,00	PC-10, PC-3, PC-9
3	Recommender Systems	E	4,00			4,00	PC-10, PC-3, PC-9
4	Large-Scale Machine Learning	E	4,00			4,00	PC-10, PC-3, PC-9
5	Deep Reinforcement Learning	E	4,00			4,00	PC-10, PC-3, PC-9
6	Stochastic Processes	E	4,00			4,00	PC-10, PC-3, PC-9
7	Information Retrieval (offered in a foreign language)	E	4,00			4,00	PC-10, PC-3, PC-9
	Data Analysis in Finance		40,00		12,00	28,00	
	Обязательные дисциплины специализации		24,00		12,00	12,00	
1	Microeconomics	C	4,00		4,00		PC-11, PC-12, PC-13
2	Econometrics and Elements of Socio-Economic Statistics	C	4,00		4,00		PC-11, PC-12, PC-13
3	Theory of Finance	C	4,00		4,00		PC-11, PC-12, PC-13
4	Asset pricing models	C	4,00			4,00	PC-11, PC-12, PC-13
5	Derivatives	C	4,00			4,00	PC-11, PC-12, PC-13

6	Financial Accounting	C	4,00				4,00	PC-11, PC-12, PC-13
	Дисциплины специализации по выбору		16,00				16,00	
1	Risk Analysis and Actuarial Calculations	E	4,00				4,00	PC-11, PC-12, PC-13
2	Valuation of Real Options	E	4,00				4,00	PC-11, PC-12, PC-13
3	Trading Strategies Development	E	4,00				4,00	PC-11, PC-12, PC-13
4	Corporate Finance	E	4,00				4,00	PC-11, PC-12, PC-13
5	Portfolio Management	E	4,00				4,00	PC-11, PC-12, PC-13
6	Quantitative Methods in Financial Planning and Valuation	E	4,00				4,00	PC-11, PC-12, PC-13
7	Game Theory and Auctions	E	4,00				4,00	PC-11, PC-12, PC-13
	Internship		32,00	6,00	4,00	7,00	15,00	
	Professional Internship		6,00		3,00	3,00		
1	Educational Internship	C	3,00		3,00			PC-1, PC-2, UC-1, UC-2, UC-4
2	Work Experience Internship	C	3,00			3,00		PC-1, PC-2, UC-1, UC-2, UC-4
	Project Internship		11,00	6,00	1,00	4,00		
1	Project	C	11,00	6,00	1,00	4,00		PC-1, PC-2, UC-1, UC-2, UC-4
	Research Internship		15,00				15,00	
1	Preparation of Graduation Thesis	C	10,00				10,00	PC-4, PC-5, PC-6, PC-7, PC-8
2	Graduation Internship	C	5,00				5,00	PC-1, PC-2, UC-1, UC-2, UC-4
	General Courses		14,00	9,00	5,00			
	Core General Courses		2,00	1,00	1,00			
1	Safe Living Basics	C	1,00	1,00				UC-11, UC-8
2	Physical Training	C	1,00		1,00			UC-3, UC-7
	Optional General Courses		12,00	8,00	4,00			
1	Elective General Course	E	4,00		4,00			UC-5
2	Economics	C	4,00	4,00				UC-5, UC-9
3	Legal Literacy	C	4,00	4,00				UC-10, UC-5
	Minor		20,00		10,00	10,00		
1	Minor	C	20,00		10,00	10,00		UC-5
	English		1,00				1,00	
	Examinations		1,00				1,00	
1	Independent English Exam	C						UC-4
2	Project Proposal	C	1,00				1,00	PC-4, PC-5, PC-6, PC-7, PC-8, UC-4
3	English Language Integrative Exam	C						UC-4
	Optional Courses							
1	Academic English Writing (offered in a foreign language)	O	2,00				2,00	UC-4
2	English (offered in a foreign language)	O	14,00	8,00	6,00			UC-4
	Data Culture		5,00			5,00		
1	Independent Programming Test. Advanced Level	C						PC-10
2	External Examinations on Digital Skills. Entry-level	C						GPC-4
3	External Examinations on Digital Skills. Intermediate Level	C						GPC-4
4	External Examinations on Digital Skills. Final Level	C						GPC-4

5	Machine Learning	C	4,00			4,00		PC-9
6	Independent Digital Literacy Test	C						GPC-4, PC-6
7	Independent Data Science Test. Advanced Level	C	1,00			1,00		GPC-3, PC-10
	Final State Certification (FSC)		1,00				1,00	
	Thesis Work		1,00				1,00	
1	Presenting of Graduation Thesis	C	1,00				1,00	GPC-1, GPC-2, GPC-3, GPC-4, GPC-5, UC-1, UC-2, UC-6

Curriculum agreed:

Academic Supervisor	MUKHIN M.S.	19.05.2022
Dean		19.05.2022
Deputy Director	KUZMIN P.V.	19.05.2022
Head of Centre for Educational Model Design	LEPESHKIN I.A.	20.05.2022

* Subject type:

Compulsory course	C
Elective course	E
Optional course	O